

Title: Calorie Count**Brief Overview:**

Students will record their guess and group members' guesses of calorie counts on a given list of food items. They will then graph a scatter plot, find the line of best fit of its equation, and use these to evaluate new data.

Links to NCTM Standards:

- **Mathematics as Problem Solving**
Students will demonstrate their ability to solve mathematical problems by applying the process of mathematical modeling to real-world data.
- **Mathematics as Communication**
Students will express in writing their generalizations discovered by investigation.
- **Reasoning**
Students will make conjectures based on results from a guided activity and then test their conjectures.
- **Statistics**
Students will use curve fitting to make predictions from data.
- **Functions**
Students will use graphs to help interpret data.

Grade/Level:

Grades 9-12

Duration/Length:

This activity will take a 90 minute block period

Prerequisite Knowledge:

Students should have working knowledge of the following skills:

- TI-83 graphing calculator
- Equations of lines
- Slope as a rate of change

Objectives:

Students will:

- work cooperatively in groups.
- collect and organize data generated by their group.
- graph a scatter plot using the graphing calculator.
- find the equation of the line of best fit.
- make predictions about new data.

Materials/Resources/Printed Materials:

- Student worksheets
- Pencils
- TI-83 Calculator
- Teacher notes
- TI-83 view screen

Development/Procedures:

- Record individual guesses.
- Record group members' guesses and calculate average guesses for each food item.
- Graph a scatter plot and find the line of best fit using the graphing calculator.
- Interpret the results.

Evaluation:

- Group evaluation will be based on completion of group activity sheets and use of graphing calculator
- Individual evaluation will be based on written responses on the activity and assessment sheets

Extension/Follow Up:

- Students may guess the number of calories consumed verses actual calories burned given a certain activity.
- Students may create a spreadsheet to determine calories needed to maintain, lose, or gain body weight given various caloric intake, activity levels, and specified time intervals.

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ACTIVITY SHEET 1: GUESS THE CALORIE COUNT

Activity 1 Page 1

Calories measure energy: The energy the body needs/uses and the energy in food. Do you actually know how many calories there are in some of your favorite foods?

INDIVIDUAL DIRECTIONS: Write down your guess for each of the food items listed below

Food	Your Guess
1 apple, medium size	
Big Mac	
Marshmallow	
Pizza Hut- 1 slice pepperoni pizza- hand tossed	
Chocolate Chip Cookie, homemade	
Chesapeake Bagel Bakery Bagel- Plain	
Carrots, sliced, 1 cup	
Beef Burrito with Red Sauce- Taco Bell	
Frosty- small from Wendy's	
M&M's plain small package	

GROUP DIRECTIONS:

A. Each member of the group should select a column number (1-5) and fill in their results from above on all group sheets.

B. For each Food item, find the average caloric guess:

$$\frac{\text{Guess 1} + \text{Guess 2} + \text{Guess 3} + \text{Guess 4} + \text{Guess 5}}{5}$$

Food	Guess 1	Guess 2	Guess 3	Guess 4	Guess 5	Group Avg. Guess	Actual calorie count
1 apple, medium size							
Big Mac							
Marshmallow							
Pizza Hut- 1 slice pepperoni pizza- hand tossed							
Chocolate Chip Cookie, homemade							
Chesapeake Bagel Bakery Bagel- Plain							
Carrots, sliced, 1 cup							
Beef Burrito with Red Sauce- Taco Bell							
Frosty- small from Wendy's							
M&M's plain oz. package							

C. Now copy down the actual calorie count as given by your teacher for each of the food items.

ACTIVITY SHEET 2

Page 1

Can you predict what someone will guess for calories based on the actual calories? You will enter the data into your TI-83 calculator and construct a scatter plot.

1. KEYSTROKES TO ENTER DATA AND VIEW YOUR SCATTER PLOT ON THE TI-83:

A. To clear all lists before you begin: **2ND + 4 ENTER**

B. The actual calorie count will go in L1, The Group Average Guess calories will go in L2:

- press **STAT**
- press **ENTER**
- Enter your actual data into L1
- Use the blue right arrow key to move to L2
- Enter your averaged guessed data into L2

C. To construct a scatter plot:

- press **2ND**
- press **Y=**
- press **ENTER**
- With the blinking cursor on “ON” press **ENTER**
- Make sure that you have highlighted the following options on the Stat Plot screen:

ON

Type: Choose the first option

X List: L1

Y List: L2

Mark: Choose the first option

- To set the window and view your graph:
 - press **ZOOM**
 - press **9**

ACTIVITY 2

Page 2

2. Before you can find the Regression Line, you need to turn on the **CORRELATION COEFFICIENT (r)**. The key strokes for this are as follows:

- press 2nd
- press 0

At this point you will be in the catalog menu. Use the blue arrow key to scroll down to: **DiagnosticOn** and press enter 2 times

3. Find the Regression Line for predicting guessed calories from actual calories. The key strokes for this are as follows

- press STAT
- Use blue arrow keys to move over to the **CALC** menu
- press 4

At this point you should have **LinReg(ax+b)** on the screen.

Now you need to define which lists your data are in. After the **LinReg(ax+b)** do the following keystrokes to define the lists to be used:

- press 2nd
- press 1
- press ,
- press 2nd
- press 2
- press ,
- press VARS
- use the blue arrow key to move over to **Y-Vars** and then press ENTER 3 times
- press Y= to find the Line of Regression

The equation of your line is: _____

ACTIVITY 2

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4. The Correlation Coefficient measures how well your Regression Line fits your data. The closer the r is to ± 1 , the better your line fits your data.

- press 2nd MODE to get back to your LinReg screen on which you will locate your r

$r =$ _____

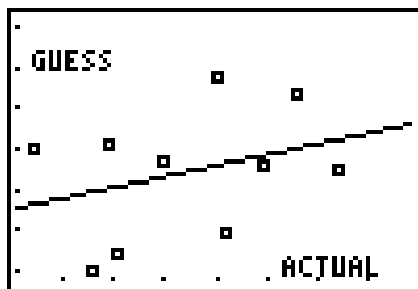
QUESTIONS

1. How well does your Regression Line fit your data?
2. Out of the different groups in class, which group guessed the best?
How do you know?
3. Do the actual calories in the food item enable you to predict accurately what people will guess? Explain
4. Interpret the meaning of slope of your model for predicting guessed calories from actual calories.
5. There are 1200 calories in a box of Girl Scout Cookies- Thin Mints. Predict what people will guess as the number of Calories in an entire box.

CALORIE COUNT ASSESSMENT ACTIVITY

Page 1

1. Scatter Plot:
 - a. What is a Scatter Plot?
 - b. What information can you interpret from a Scatter Plot?
2. What does a Regression Line tell you?
3. Based on the Stat Plot and Regression line
($y = .268242x + 162.353$) below answer the following questions:



* each tic mark on the X and Y axis are separated by 50 units

- a. James is eating lunch. When asked how many calories he is consuming, he responds “330 calories”. How many calories is he actually consuming? Find your answer using two different methods.
- b. Which method, in *a*, did you like the most and why?

CALORIE COUNT ASSESSMENT ACTIVITY

Page 2

- c. Michelle is purchasing lunch. She guesses the amount of calories and then asks the waiter for the precise amount of calories contained in her meal. The waiter indicates her lunch totals 280 calories. What was her guess?**

- d. What method did you use to determine Michelle's guess?**

- e. How was the computation of calories between James and Michelle different?**

- f. What is the significance between points above or below the Regression Line?**

- g. If points are above or below the Regression Line by a large amount, what does this mean?**

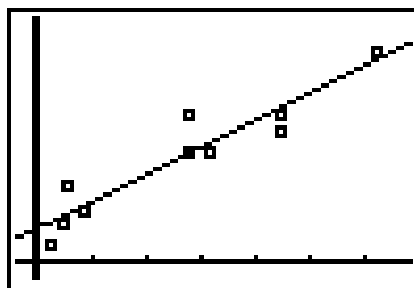
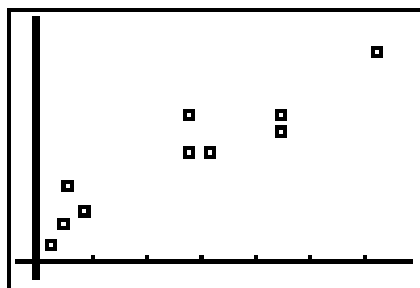
TEACHER NOTES

Page 1

1. Please relate the objectives of this activity to your students:
 - a. Learning about and finding the line of best fit of a scatter plot for a given set of data by using linear regression on the TI-83.
 - b. Manipulating and calculating guessed and actual calories using a linear regression line.
 - c. Understanding the significance of a correlation coefficient.
2. Put the following chart on an overhead or chalkboard to show the students the actual Calories in the food

Food	Actual Calorie Count
1 apple, medium size	80
Big Mac	560
Marshmallow	23
Pizza Hut- 1 slice pepperoni pizza- hand tossed	250
Chocolate Chip Cookie, homemade	51
Chesapeake Bagel Bakery Bagel- Plain	287
Carrots, sliced, 1 cup	48
Beef Burrito with Red Sauce- Taco Bell	403
Frosty- small from Wendy's	400
M&M's plain small package	250

3.



- These are examples of the Scatter Plot and a Scatter Plot containing the Regression Line --X axis is Actual Calories; Y axis is Guessed Calories.

TEACHER NOTES

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4. QUESTIONS FROM ACTIVITY 2: Possible Responses

1. How well does your Regression Line fit your data?

You might tell students to use the following guidelines;

$\pm .8$ to ± 1	Strong Correlation between Data and Regression Line
$\pm .4$ to $\pm .7$	Medium Correlation between Data and Regression Line
$\pm .1$ to $\pm .3$	Weak Correlation between Data and Regression Line
0	No Correlation between Data and Regression Line

2. Out of the different groups in class, which group guessed the best? How do you know?

Answers will vary based on Group Responses

3. Do the actual calories in the food item enable you to predict accurately what people will guess? Explain

Answers will vary based on Group Responses and how closely their data and the Regression line Correlate

4. Interpret the meaning of slope of your model for predicting guessed calories from actual calories.

For example: Say your students found that the slope of their Regression Line is 2.5. This means that the guessed calories will increase by 2.5 each time the actual calories increase by 1

5. There are 1200 calories in 1 box of Girl Scout Cookies- Thin Mints. Predict what people will guess as their estimate of the number of Calories in an entire box.

Since X = Actual Calories and Y = Guessed Calories, the students will substitute 1200 for X and solve for Y . Answers to this will vary based on their Regression Equations.

5. ASSESSMENT ACTIVITY

1. What does a Scatter Plot tell you?

a. A scatter plot is an ideal tool for looking at patterns in relationship between the two quantities- actual calories and guessed calories; and b. You can then determine what kind of relationship the variables have, whether it is a linear, quadratic, quartic, trigonometric etc. relationship

TEACHER NOTES

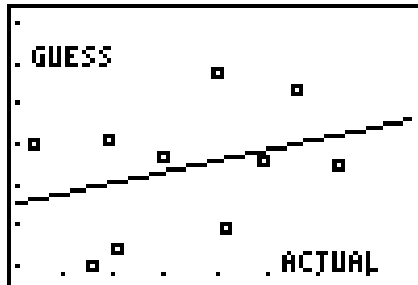
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2. What does a Regression Line tell you?

The Regression Line tells you how the actual calorie value relates to the guessed calorie value. In this case the guessed calorie value depends on the actual calorie value. Actual Calories is the Explanatory Value and the Guessed Calories is the Response Variable

3. Based on the Stat Plot and Regression line

($y = .268242x + 162.353$) below answer the following questions:



* each tic mark on the X and Y axis are separated by 50 units

- a. James is eating lunch. When asked how many calories he is consuming, he responded “330 calories”. How many calories is he actually consuming? Find your answer using two different methods

about 625 calories

- b. Which method, in *a*, did you like the most and why?

Possible methods:

1. Substitute 330 for y in the Linear Regression Equation
2. Use the graph above
3. Find the intersection of $Y_1 = .268242x + 162.353$ and $Y_2 = 330$

- c. Michelle is purchasing lunch. She guesses the amount of calories and then asks the waiter for the precise amount of calories. The waiter indicates her dinner totals 280 calories. What was her guess?

about 237.5 calories

TEACHER NOTES

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d. What method did you use to determine Michelle's guess?

Possible methods:

1. Substitute 280 for x in the Linear Regression Equation
2. Use the graph above

e. How was the computation of calories between James and Michelle different?

James was finding the actual calories given the guessed calories, whereas Michelle was finding the guessed calories given the actual calories

f. What is the significance in points above or below the Regression Line ?

Points above the line are overestimates and points below the line are underestimates

g. If points are above or below the Regression Line by a large amount, what does this mean?

That your caloric guess was quite different from the actual calorie count.

TEACHER NOTES

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Rubric for Assessment Activity Calorie Count (20 Points)

1. a. 1 Point
b. 2 Points
2. 1 Point
3. a. 2 Points - stating the two methods
1 Point - extracting answer from graph
2 Points - calculating the answer by solving equation
b. 1 Point
c. 2 Points - calculating the guess by solving equations
d. 2 Points
e. 2 Points - explaining actual and guessed calories
f. 1 point - explanation about points above
1 Point - explanation about points below
g. 2 Points